The mirror on the Moon

Karen Ni Mheallaigh

On July 21st 2019 people all over the world celebrated the fifty-year anniversary of the first human steps on the Moon. But the earliest human to walk on the Moon did so imaginatively two thousand years ago among the pages of two short works – the *Icaromenippus* and *True History* – composed by Lucian of Samosata, a Syrian writer of Greek in the late second century A.D. In one of these works, Lucian looks down on the Earth through a marvellous magnifying mirror. As Karen Ni Mheallaigh shows, there is more to this device than meets the eye: it represents complex links between the mirror and the Moon in ancient thought, points us towards the earliest maps of a world beyond our own, and provides an embryonic version of the modern telescope.

Setting up the mirror

In *True History* (an ironical title), the narrator, Lucian, records his adventures when he flies to the Moon. There he encounters Endymion, the King of the Moon, joins in a cosmic battle against the army of the Sun, and describes in detail the marvellous customs of the men (for as he reveals, it is exclusively men) on the Moon. But the climax of lunar wonders is a great mirror, propped over a shallow well. This curious device enables the visitor who clambers into it to see and hear what is happening on the Earth far below:

> *Now if one goes down into the well, one hears everything that is being said by our people on the earth, and if one looks into the mirror, one sees all the cities and all the peoples, just as if one were standing over them. On that occasion I observed my family and my entire homeland, but I cannot now tell for sure if they saw me. Whoever does not believe that this is so, if ever he reaches that place himself, he will know that I am telling the truth.*

Of all of the intriguing artefacts from the story-world of *True History*, this is arguably the most fascinating. In view of the mirror's great magnifying powers, it is usually interpreted as a symbol of Lucian's fantasy, which similarly amplifies and exaggerates – for comic effect – features usually found in more everyday, factual works of history. The *True History* itself is a sort of distorting mirror that exposes the historian's skilful deceptions by exaggerating them to ridiculous proportions. The lunar mirror, then, flashes the text's satirical power back at the reader from within.

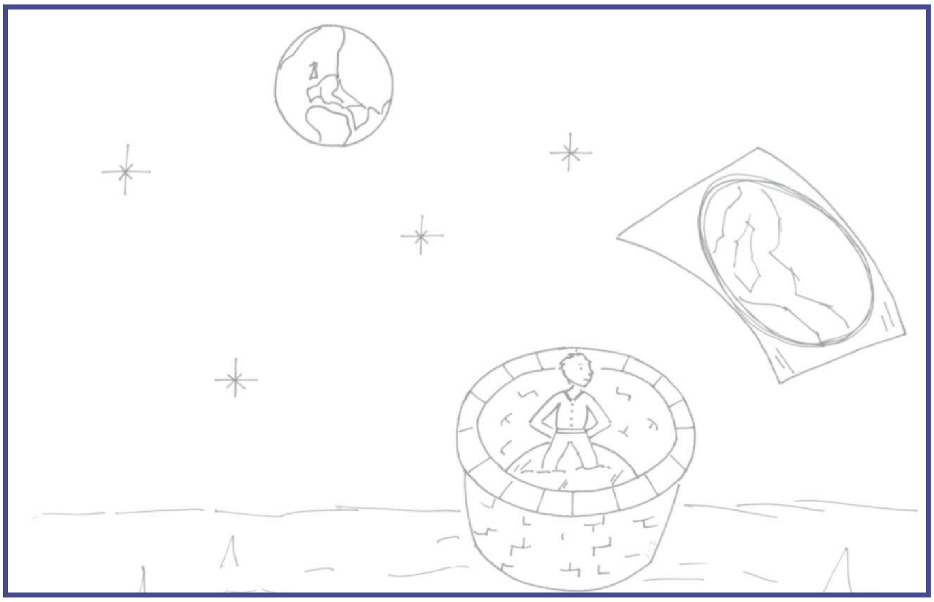
But there is more to say about this fantastical instrument. To the modern reader, it seems to leap off the page and anticipate other optical instruments – real and imagined – far in the future: satirical fantasies of the seventeenth and eighteenth centuries and, more uncannily, Galileo's telescope, or even the first photographs taken of Earth from the Moon.

Lucian's fantasy had scientific weight as well, for in his invention we can detect reflections of ancient scientific theories about the nature of the Moon and its relationship to our world. Moreover, Lucian's device evokes real observational technology from his own time.

An eye in the sky: the art of history-writing

Viewed from one angle, Lucian's lunar mirror-well is the ultimate historical research tool. Lucian was fascinated by history-writing. In his essay *On how to write history*, he advises the would-be historian to cultivate a perspective that is unclouded by bias and uncluttered by literary embellishment: the historian's mind should, Lucian says, be *like a mirror* that reflects the world with undistorted clarity. Moreover, the historian should, Lucian continues, strive to achieve an idealized bird's-eye view, like Zeus observing the world unprejudiced from above. Lucian's audio-visual apparatus in *True History* offers the space-traveller precisely such an opportunity for historical research. From this vantage point, one can see and hear *everything*, totally unencumbered from earthly happenings below.

Of course, that this historiographical technology should be embedded in a narrative of the most outrageous lies like *True History* is a master-stroke of Lucian's irony. You are, Lucian implies, as likely to find an honest historian as to come across a man on the Moon...



Lucian in the mirror-well (drawing by Olivia Clarke, courtesy of Arthur Drake).

Selēnoskopia and the philosophical eye

But Lucian's fantastical view from the Moon – or *selēnoskopia* – also strikes philosophical chords. It plays with the motif of *kataskopia* or the 'view from above' that was characteristic of certain types of satirical literature in antiquity. In a variation on this theme, Lucian offers his viewer the ultimate view from above – from the Moon. This, in turn, plays on the 'cosmic viewpoint' of contemporary philosophy. Trying to achieve a 'cosmic viewpoint' was an exercise of mental and emotional detachment that was beloved of Stoic philosophers as eminent as the Emperor Marcus Aurelius, in whose reign Lucian lived and worked. For Lucian, philosophy seems to be a species of lunacy.

Here in *True History*, however, the emphasis is less on *what* Lucian sees from his cosmic viewpoint, and more on *how* he achieves his vision: through a marvellous mirror suspended above a well. The components of this device can offer us deeper access into ancient thought about the Moon's nature.

The great cosmic mirror

In Aristophanes' comedy *Clouds* (late fifth century B.C.), a curmudgeonly farmer fantasizes about pulling the Moon down from the sky and locking it away in a box 'like a mirror'. Aristophanes is poking fun at new intellectual ideas in this play, and this striking image could represent the old farmer's garbling of a new philosophical theory that the Moon itself was a 'mirror-like body' in the sky. This idea, which was ascribed to Pythagoras, was evidently related to 'heliophotism', the revolutionary theory of the fifth century B.C. that the Moon reflected the Sun's light, like a great celestial mirror – a theory which we now accept as fact.

Later philosophers expanded this into the idea of the *speculum lunae* or 'mirror-moon', which held that the Moon was literally a huge mirror suspended above our world. This theory was used to explain the peculiar dark blotches that mottle the lunar surface. According to Clearchus of Soli, one of Aristotle's pupils, these blotches – the so-called 'Man in the Moon' – were actually mirror-reflections of the Earth's oceans far below. By this reasoning, the Moon offered itself as a map of our world, revealing in its mirror-like surface remote terrestrial features that were as yet unexplored or difficult to reach. For ancient earth-bound viewers, restricted by their physical location and geographical obstacles, the Moon functioned as an 'encyclopaedic mirror,' a device that reflected back to them images of things that lay beyond their normal sight: the mirror-Moon, then, was a sort of prosthetic eye that extended the natural range of our vision. This theory converted the Moon into a cartographical resource which was actually used by map-makers of the medieval and early modern period as a guide to the Earth's topography.

The first lunar map

The extraordinary mirroring between the Moon and Earth worked in the opposite direction too. It not only guided early efforts to map the Earth, but also prompted the earliest attempts to map the Moon, based on its similarity to the Earth.

We are now accustomed to maps and lunar globes that identify features of the Moon by the rather fanciful names that the Jesuit scholar Riccioli assigned to them in 1651: the 'Sea of Tranquillity', the 'Sea of Clouds', and so on. Prior to that, however, it had a more mundane system of names, built on the assumption that the Moon was the mirror-image of our world. In Hevelius' landmark map of the Moon from 1647, for example, you could find a Black Sea (*Pontus Euxinus*) on the Moon, along with a lunar version of the Mediterranean. The logic is clear: if the blotches on the Moon's surface were mirror-reflections of the Earth's seas, then why not give them the same names as these terrestrial features?

We can also find fascinating glimmers of a *pre*-modern tradition of lunar mapping that was based on the same assumptions about the mirror-Moon. In his short treatise *On the black figure in the Moon* (c. A.D. 1300), the Byzantine writer Demetrius Triclinius tried to make sense of the 'Man in the Moon' precisely in terms of the Earth's oceans. Triclinius' treatise included a wonderful drawing of the Moon that obviously mirrors maps of the Mediterranean world of the time, showing us how the Moon was construed in terms of our own world's geography.

Earlier still, evidence for lunar mapping is found in Plutarch's essay *On the face of the Moon*, which is dated to the late first century A.D. Where Triclinius saw a fully articulated body reflected on the Moon, Plutarch saw a face: two eyes and a gaping mouth. He too reports the theory that these blotches correspond to features on the Earth below, and he reveals strikingly evocative names for them such as 'Hecate's Hollow', for the large, dark chasm on the Moon where the souls of the dead undergo punishment for their transgressions in life. Plutarch's names point us in another direction, towards an earlier phase in lunar mapping, which reflects the Moon's connection with the realm of the dead. Nevertheless, this earliest evidence of lunar cartography is associated with the belief that the Moon reflects the Earth, mirror-like.

Lucian's lunar observatory

This leads us back to the device that is located on Lucian's Moon. Through it, the viewer observes the *Earth*, in what is clearly a play on this tradition of the mirror-Moon. But Lucian's device also plays with the astronomical technology of the second century A.D.

The lunar mirror is a technological fantasy, offering the viewer a perspective that is simultaneously condensed *and* magnified. The viewer sees in its surface an absolute panorama of the Earth ('*all* the cities and *all* the peoples'), which is also revealed in minute detail ('as if he were standing over each one'). It therefore seems to combine – impossibly – the effects that were known to be achieved by the convex mirror (condensation) *and* the concave (magnification). Nevertheless, this imaginary panoramic device evokes the actual use of mirrors both as surveillance devices and to generate optical illusions (e.g. trick-mirrors in temples) in Lucian's world. The magnifying, vision-bending property of mirrors (particularly convex mirrors) is still commonly relied upon today to show drivers oncoming traffic as they edge out of their drive-ways, and it was well-known to Lucian's readers. Detailed descriptions of such devices can be found in Hero of Alexandria's technical treatise on mirrors, *Catoptrica*, which dates probably to the first century A.D.

The role of the *well* in Lucian's device is more puzzling in some respects. Its primary role is to amplify *sounds* from the Earth below so that they can be heard on this remote outpost on the Moon. But I suspect the presence of yet another technology lurking beneath its surface, and that Lucian's shallow well is a version of the *dioptra* or 'seeing tube' that was used in antiquity both for land surveying and astronomical observation. One form of the *dioptra* was a simple hollow tube which the viewer could hold up to his or her eye whilst observing the sky. It should not be confused with the telescope, since it did not contain a lens and did not magnify vision in any way; it simply aided observation by focusing the line of vision on a specific segment of the sky and blocking out ambient light. Aristotle explains that it is similar to the effect achieved by shading one's eyes with one's hands, and it is for this reason, he claims, that animals with sunken eyes have keener distance-vision than those whose eyes are prominent. The same *dioptra*-effect could also be achieved by digging a pit or well: the viewer descended into the well and looked upwards at the sky from the bottom, using the rim as an artificial horizon. Aristotle in fact tells us that people sometimes *see stars* from such pits and wells.

It begins to look as if Lucian's device is drawing together several of the observational technologies that were available to him during his own time: a well that works as a full-body immersive *dioptra* and also amplifies sound, and a gigantic panoramic mirror to compress and magnify vision. Even the lunar location itself is significant, for this elevation is infinitely superior to any of the common spots used by ancient astronomers for surveying the cosmos, such as a house-roof or mountain-top. What Lucian has invented is a super, multi-sensory observatory on the Moon.

Whether or not this observatory was actually functional is a separate question and one that probably did not really interest Lucian at all. The *True History* is not the place to find the nuts and bolts of real-world machinery. But it is the presence of any sort of observational technology at all that is compelling. After all, the *selēnoskopia* of the *Icaromenippus* – Lucian's other lunar work – is achieved through purely magical means, and Lucian could have done the same in *True History*, but he decided otherwise. For this reason, if no other, the presence of the mirror and the well demands not just our wonder, but our critical scrutiny.

Looking towards the future

Lucian's device, therefore, can be seen as symbol of satire as well as a play on the ubiquitous theories that associated the Moon with mirrors in antiquity. But it is also something more daring: Lucian has imagined into existence a fantastical *proto-telescope*, for he has welded together with imaginative ingenuity the disparate apparatus of ancient astronomical observation. Although fantasy, the mirror-well was rooted in ancient technological realities. Moreover, its very components – some realistic, some not – seem to embody the interplay between fact and fancy that is central to Lucian's work.

Finally, this instrument seems to look directly at us across the centuries, where Lucian's fantasy has become reality and humans have actually walked on the Moon and looked back from its surface at the Earth. This artefact from the ancient scientific imagination has a rich story to tell about lunar exploration: about truth, lies, and the long history of telescopic aspiration in the pre-modern world. Something to remember as we celebrate the fiftieth anniversary of successful human Moon-travel this year!

Karen Ni Mheallaigh teaches Classics at the University of Exeter, and is happiest when escaping into the worlds of fiction, wonder-literature, and the ancient scientific imagination, even if trips to the Moon are mostly off-limits.